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Original article

Clinical analysis of retroperitoneoscopic nephroureterectomy for renal tuberculosis

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Abstract

Objectives: To explore the feasibility and safety of retroperitoneoscopic nephroureterectomy for kidney tuberculosis.**Methods:** Forty-eight retroperitoneoscopic nephroureterectomies and thirty-five nephroureterectomies for kidney tuberculosis procedures were performed from June 2008 to December 2014. The patients consisted of 53 males and 30 females with a mean age of 36 years (range: 26–51 years). The patients' data were reviewed and analyzed.**Results:** The retroperitoneoscopic nephroureterectomy procedures were completed successfully in 48 cases with no conversions to open surgery. The mean operating time was 170 minutes (range: 121–258 minutes), the mean blood loss was 110 ml (range: 70–250 ml), and the mean hospital stay was 5.70 days (range: 5–14 days); these were all much less than nephroureterectomy procedures ($P < 0.05$). A total of five minor complications (10.4%) occurred, injury to the peritoneum was observed in three patients, and infection at the incision site was observed in two patients, there were no obvious difference between the two surgical methods ($P > 0.05$). Seventy-five patients were followed up, and the average follow-up time was 12.5 months (range: 6–20 months). All the patients recovered without any lesions remaining.**Conclusions:** The results of this study indicate that retroperitoneoscopic nephroureterectomy is a feasible, safe, effective, and less invasive treatment modality for treating renal tuberculosis.© 2016 Chinese Medical Association. Production and hosting by Elsevier B.V. on behalf of KeAi Communications Co., Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).**Keywords:** Renal tuberculosis; Retroperitoneoscopic; Nephroureterectomy

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Tuberculous nonfunctioning kidney has been recognized as a contraindication for laparoscopic surgery because of severe perinephritis, dense fibrotic adhesions, intraoperative hemorrhage, spillage of caseous material, and an increased open conversion rate. However, the accumulation of laparoscopic experience has improved our understanding of laparoscopic anatomy and has allowed safe and effective

nephroureterectomies to be performed with a refined level of technical skill. In the present study, we summarized the results of 48 consecutive retroperitoneoscopic nephroureterectomies and 35 nephroureterectomies for treating renal tuberculosis.

Materials and methods

In the present study, the patients consisted of 53 males and 30 females with a mean age of 36 (range: 26–51 years). Of these 83 patients, 49 had lesions on the left kidney, and 34 patients had lesions on the right kidney. Eighty patients had pulmonary tuberculosis, 72 patients had ureteral tuberculosis, and eight patients had intestinal tuberculosis. All the patients were diagnosed by symptoms, a urinary tuberculosis test, cystoscopy and computed tomographic urography (CTU). They all had normal renal function on the contralateral side. Severely impaired renal function of the lesion side was confirmed before the operation. Antituberculosis chemotherapy was administered to the patients for one half to six months prior to the surgery. No active tuberculosis lesions were observed, and the erythrocyte sedimentation rate (ESR) levels were normal before the operation. All the operations were performed successfully without conversion to open surgery.

In the retroperitoneoscopic nephroureterectomy procedure, general anesthesia was induced via tracheal cannulation. The patients were placed in the lateral position with the diseased side facing up. The ports were usually placed as follows: 2 cm above the iliac crest in the midaxillary line, below the twelfth rib in the posterior axillary line, the anterior axillary line. The retroperitoneoscopic working space was developed, and the psoas muscle was identified as a landmark. Gerota's fascia was opened, and the kidney with the lesion was dissected along the psoas muscle. After the renal pedicle was identified, the renal arteriovenous was exposed and removed after it was occluded with Hem-o-lok clips. The renal lesion was completely dissociated outside the capsular adipose and along the ureter to the bifurcation of the iliac vessels. In this cohort, 28 cases were moved to a horizontal position, and an approximately 4 cm oblique incision was made in the lower abdomen to remove specimens and dissociate the lower ureteral segment under direct vision. A group of 20 patients underwent resection of the ureteral orifice and the inner wall using a lithotomy position transurethral resection before the nephrectomies, and the specimens were removed through a minimal incision in the lower abdomen.

The nephroureterectomy procedure proceeded under continuous epidural anesthesia, and the kidney with the lesion was dissected and removed after the renal arteriovenous and the ureter were blocked.

The collected data were analyzed using the SPSS software (Statistical Package for the Social Sciences, version 13.0, SPSS Inc, Chicago, Illinois, USA). The statistical analysis used *t* tests and the Fisher's Exact Test, where appropriate. A *P* value less than 0.05 was considered significant.

Results

The retroperitoneoscopic nephroureterectomy procedures were completed successfully in 48 cases with no conversions to open surgery. The mean operating time was 170 minutes (range: 121–258 minutes), the mean blood loss was 110 ml (range: 70–250 ml), and the mean hospital stay was 5.70 days (range: 5–14 days). In the nephroureterectomies group, the mean operating time was 220 minutes (range: 165–292 minutes), the mean blood loss was 184 ml (range: 150–215 ml), and the mean hospital stay was 7.93 days (range: 6–18 days). These values in the retroperitoneoscopic nephroureterectomy procedures were all significantly lower than in the nephroureterectomy procedures ($P < 0.05$).

A total of five minor complications (10.4%) occurred in the retroperitoneoscopic nephroureterectomy group; injury to the peritoneum was observed in three patients, and infection at the incision site was observed in two patients. And in nephroureterectomy group, there were four minor complications; two peritoneum injuries and two incision infections. There were no obvious differences between the two surgical methods ($P > 0.05$) (Table 1).

Seventy-five patients were followed-up, and the average follow-up time was 12.5 months (range: 6–20 months). After the operations, the symptoms of urinary frequency and urgency disappeared, and no active tuberculosis lesions were observed at the ESR level. Routine urinalyses results were normal. The detection of acid-fast bacilli in all of the patients' postoperational urinary samples was negative. All the patients recovered without any remaining lesions.

Discussion

Retroperitoneoscopic nephroureterectomy for kidney tuberculosis has presented several technical difficulties for laparoscopic procedures, and different medical units have chosen different operation

Table 1
Comparisons of the two groups.

Item	Group 1 ^c	Group 2 ^d	P ^b
Operating time (minutes, mean \pm SD)	170 \pm 24 ^a	220 \pm 30	0.042
Blood loss (ml, mean \pm SD)	110 \pm 17	184 \pm 17	0.038
Hospital stay (days, mean \pm SD)	5.70 \pm 1.41	7.93 \pm 2.18	0.041
Peritoneum injury, n (%)	3 (6.25-)	2 (5.71-)	1.000
Incision infection, n (%)	2 (4.17-)	2 (5.71-)	1.000

^a Data showed as mean \pm SD and rate. SD = standard deviation.

^b P = group 1 vs. group 2.

^c Group 1 was using retroperitoneoscopic nephroureterectomy.

^d Group 2 was using nephroureterectomy.

procedures, different methods of ureteral management and different intraoperative separation planes.

Nephrectomy via the peritoneal and the retroperitoneal approach are the two main procedures. Many studies in last decade have proven that retroperitoneoscopy offers versatile access for many urologic indications.^{1–3} Current indications have extended to include radical operations (radical nephrectomy, nephroureterectomy) and reconstructive procedures (pyeloplasty, partial nephrectomy). Although they were previously considered to be absolute contraindications, obesity, the presence of intense perirenal fibrosis secondary to xanthogranulomatous pyelonephritis, and a history of genitourinary tuberculosis are now regarded to be relative contraindications.^{4,5} The retroperitoneal approach can avoid dissemination of the tuberculosis bacterium and can reduce interference to the abdominal viscera. Manohar's⁶ study found that there was a significant interaction between the kidneys with lesions having a longitudinal diameter >10 cm and the presence of enlarged renal hilum lymph nodes and surgical complications and intraoperative conversion to open surgery. From this study, the following conditions were contraindications for retroperitoneoscopic nephroureterectomy: a. repeated back pain and high fevers resulting from bacterial infection; b. percutaneous drainage and an operational history on the kidney with a lesion; c. CT examination showing the absence of a high-density perinephric adipose capsule, perinephric fascial thickening, psoas abscess and perinephric lesion abscess, and unapparent deformation of the kidney with the lesion; d. enlarged lymph nodes around the renal hilum; and e. the longitudinal diameter of the kidney with the lesion was less than 10 cm. Because of the correct indications we used in the present study, retroperitoneoscopic nephroureterectomy was successfully performed in all 48 cases without conversion to open surgery.

There are different opinions about whether to resect the ureter after nephrectomy for tuberculosis kidney.^{7,8} Guobiao Liang et al⁸ reported a rate of ureteral syndrome as high as 12% when the ureteral residual end was not removed, which makes the antituberculosis therapy invalid and leads to bladder contracture and a protracted course of disease. In the present study, nephroureterectomy was performed in all the cases, and the treatment to the lower segment ureter was performed in two different ways: under direct vision through a small incision in the hypogastrium after the nephrectomy and by using a resectoscope to perform resection of the ureteral bladder wall before the nephrectomy in which the lower segment of the ureter was resected through a small incision in the hypogastrium. In the present study, two types of processing methods demonstrated similar effects. However, in cases where preoperation CT examination showed ureteral thickening of the lower segment and obvious deformations or if the resectoscope showed ureteral orifice atresia, we would choose the former method to manage the lower ureteral segment. If the latter method were chosen, the upper urinary tract should be clipped before nephrectomy to avoid the spread of *Mycobacterium tuberculosis*. To ensure the bladder wound healing, the urine tube should be retained for two weeks postoperatively.

In laparoscopic nephrectomy procedures for tuberculous nonfunctioning kidneys, the main reasons for conversion to open surgery are perinephric adhesions and intraoperative major hemorrhages.⁹ Many investigators have regarded the tuberculous nonfunctioning kidney as a relative contraindication for laparoscopic nephrectomy because of the difficulty in dissection, high conversion rate, and the risk of spillage of caseous materials with subsequent dissemination of the disease.¹⁰ In the present study, the most difficult part of the procedure was dissection of the dense adhesions and all the surgical steps. The dissociation and ligation of the renal pedicle is the most important step of the procedure and should be managed as early as possible. After expanding the retroperitoneal space, we first try to dissociate the perinephric fascia and the perirenal fat. The fatty tissues around the renal hilum should be dissected carefully, and once the renal pedicle tissue is separated to an adequate thickness, the renal artery, the vein and the ureter are ligated separately. When the renal hilum was managed, we can shorten the operation time and reduce intraoperative blood loss by identifying the correct plane for dissociation. Xu Zhang et al¹¹ proposed dissociation of the diseased kidney along the renal capsule or subcapsule,

while Ricardo et al.¹ proposed dissociation along the perinephric fascia to avoid adhesional and fibrosis tissues. Considering the proximity to the diseased kidney and the more distinct adhesion, we dissociated the kidney along the adipose capsule, which made the dissection easier and reduced blood loss.

In our study, the mean operating time, the mean blood loss and the mean hospital stay in the retroperitoneoscopic nephroureterectomy procedures were much less than in the nephroureterectomy procedures ($P < 0.05$). The rate of complications between the two groups were similar ($P > 0.05$). Comparing with nephroureterectomy, the retroperitoneoscopic nephroureterectomy procedure was safer, more effective, and less invasive.

Conclusions

With the improvement of laparoscopic techniques, retroperitoneoscopic nephroureterectomy for tuberculous nonfunctioning kidney is safe and feasible in appropriate cases. The keys to the success of the operation are rapid ligation of the renal vascular pedicle by identifying a relevant anatomical landmark and dissociation along the correct plane.

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